



REGIS T. REPKO  
Vice President  
McGuire Nuclear Station

Duke Energy  
MG01VP / 12700 Hagers Ferry Rd.  
Huntersville, NC 28078

980-875-4111  
980-875-4809 fax  
regis.repko@duke-energy.com

August 11, 2010

U.S. Nuclear Regulatory Commission  
ATTENTION: Document Control Desk  
Washington, D.C. 20555

Subject: Duke Energy Carolinas, LLC  
McGuire Nuclear Station, Unit 1  
Docket No. 50-369  
Licensee Event Report 369/2010-03, Revision 0  
Problem Investigation Process Number M-10-04111

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report (LER) 369/2010-03, Revision 0, regarding completion of a Technical Specification required shutdown of Unit 1 accomplished by manually actuating the Reactor Protection System to trip the reactor. Subsequent to the trip, the Unit 1 Auxiliary Feedwater System was manually actuated to maintain Steam Generator inventories.

This report is being submitted in accordance with 10 CFR 50.73 (a) (2) (i) (A), "Plant Shutdown Required by Technical Specifications" and 10 CFR 50.73 (a) (2) (iv) (A), "System Actuation".

This event is considered to be of no significance with respect to the health and safety of the public. There are no regulatory commitments contained in this LER.

If questions arise regarding this LER, contact Julius W. Bryant at 980-875-4162.

Sincerely,

Regis T. Repko

Attachment

TE22  
NIRK

U.S. Nuclear Regulatory Commission

August 11, 2010

Page 2

cc: L. A. Reyes  
Administrator, Region II  
U.S. Nuclear Regulatory Commission  
Marquis One Tower  
245 Peachtree Center Ave., NE Suite 1200  
Atlanta, GA 30303-1257

J. H. Thompson  
Project Manager  
U.S. Nuclear Regulatory Commission  
11555 Rockville Pike  
Mail Stop O-8 G9A  
Rockville, MD 20852-2738

J. B. Brady  
NRC Senior Resident Inspector  
McGuire Nuclear Station

W. L. Cox III, Section Chief  
North Carolina Department of Environment and Natural Resources  
Division of Environmental Health  
Radiation Protection Section  
1645 Mail Service Center  
Raleigh, NC 27699-1645

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 50 hours.  
Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOF-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

## 1. FACILITY NAME

McGuire Nuclear Station, Unit 1

## 2. DOCKET NUMBER

05000- 0369

## 3. PAGE

1 OF 6

## 4. TITLE

Dropped Control Rods Resulting in Completion of a Technical Specification Required Shutdown and Actuation of the Reactor Protection System and Auxiliary Feedwater System.

## 5. EVENT DATE

MO DAY YEAR  
06 12 2010

## 6. LER NUMBER

YEAR SEQUENTIAL REV  
2010 - 003 0 NO

## 7. REPORT DATE

MO DAY YEAR  
08 11 2010

## 8. OTHER FACILITIES INVOLVED

## FACILITY NAME

None

## DOCKET NUMBER

## FACILITY NAME

None

## DOCKET NUMBER

## 9. OPERATING MODE

1

## 10. POWER LEVEL

44

## 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

☐ 20.2201(b)☐ 20.2203(a)(3)(i)☐ 50.73(a)(2)(i)(C)☐ 50.73(a)(2)(vii)☐ 20.2201(d)☐ 20.2203(a)(3)(ii)☐ 50.73(a)(2)(ii)(A)☐ 50.73(a)(2)(viii)(A)☐ 20.2203(a)(1)☐ 20.2203(a)(4)☐ 50.73(a)(2)(ii)(B)☐ 50.73(a)(2)(viii)(B)☐ 20.2203(a)(2)(i)☐ 50.36(c)(1)(i)(A)☐ 50.73(a)(2)(iii)☐ 50.73(a)(2)(ix)(A)☐ 20.2203(a)(2)(ii)☐ 50.36(c)(1)(ii)(A)☒ 50.73(a)(2)(iv)(A)☐ 50.73(a)(2)(x)☐ 20.2203(a)(2)(iii)☐ 50.36(c)(2)☐ 50.73(a)(2)(v)(A)☐ 73.71(a)(4)☐ 20.2203(a)(2)(iv)☐ 50.46(a)(3)(ii)☐ 50.73(a)(2)(v)(B)☐ 73.71(a)(5)☐ 20.2203(a)(2)(v)☒ 50.73(a)(2)(i)(A)☐ 50.73(a)(2)(v)(C)☐ OTHER☐ 20.2203(a)(2)(vi)☐ 50.73(a)(2)(i)(B)☐ 50.73(a)(2)(v)(D)☐ Specify in Abstract below  
or in NRC Form 366A

## 12. LICENSEE CONTACT FOR THIS LER

## FACILITY NAME

Julius W. Bryant, Regulatory Compliance

## TELEPHONE NUMBER (Include Area Code)

980-875-4162

## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU- FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU- FACTURER	REPORTABLE TO EPIX
B	JD	JC	W120	YES					

## 14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete EXPECTED SUBMISSION DATE) ☒ X ☐ NO15. EXPECTED  
SUBMISSION  
DATE

## MONTH

## DAY

## YEAR

## 16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

**Event Description:** On June 10, 2010, Unit 1 Shutdown Bank "B" Rod N7 dropped fully into the core. On June 12, 2010, Unit 1 Shutdown Bank "B" Rod J13 dropped fully into the core while Rod N7 was still dropped. As directed by procedures, Operators initiated a Unit 1 Reactor trip by manually actuating the Reactor Protection System. Subsequent to tripping Unit 1, the 1A and 1B Motor Driven Auxiliary Feedwater Pumps were manually actuated to maintain Steam Generator levels.

**Event Cause:** A regulation card in a Rod Control System Power Cabinet experienced an intermittent connection due to a degraded solder joint. This intermittent connection caused a drop in the current supply to the Control Rod Drive Mechanisms (CDRMs) for Unit 1 Shutdown Bank "B" Rod N7 and Unit 1 Shutdown Bank "B" Rod J13. Current dropped to levels which allowed the CRDM grippers to drop Rods N7 and J13 into the core.

**Corrective Actions:** The degraded Rod Control System Power Cabinet regulation card was replaced. Additional preventative maintenance strategies will be evaluated for identifying degraded solder joints on cards in the Rod Control System Power Cabinets. Replacement of selected cards in the Rod Control System Power Cabinets with an upgraded card will be evaluated.

## LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
McGuire Nuclear Station, Unit 1	05000369	2010	003	00	2 OF 6

## 17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

BACKGROUND

The following information is provided to assist readers in understanding the event described in this LER. Applicable Energy Industry Identification [EIIS] system and component codes are enclosed within brackets. McGuire Nuclear Station unique system and component identifiers are contained within parentheses.

Rod Control System [JD] (IRE):

The IRE System provides for Reactor power modulation by manual or automatic control of full length control rod banks in a pre-selected sequence and for manual operation of individual banks. Each Unit has four Control Banks and five Shutdown Banks and each of these Banks are divided into Groups. For each Group, Group Step Counters indicate the demand position of a Group in "steps". The system provides a means to trip the Reactor and place it in a shutdown MODE by inserting a large amount of negative reactivity.

The IRE System takes input from the Reactor Control System (while in automatic) or the Reactor Operator (while in manual) to position the full length control rods to the desired position in the core. The major components necessary to convert an input signal to actual rod motion are: the Logic Cabinet, the Power Cabinets, and the CRDMs. The Logic Cabinet generates signals for speed and direction based on input information from the Reactor Control System or the Reactor Operator. The five Power Cabinets receive signals from the Logic Cabinet and utilize regulation cards [JC], phase control cards [JC], and firing cards [JC] to generate the appropriate currents to the CRDMs for holding or moving the rods served by their respective Power Cabinet. Opening the Reactor Trip Breakers will disrupt power to the Power Cabinets and the CRDMs, allowing the rods to fall into the core.

Technical Specification (TS) 3.1.4 - "Rod Group Alignment Limits" specifies that all Shutdown Bank rods and Control Bank rods shall be operable in MODES 1 and 2, with all individual indicated rod positions within 12 steps of their Group Step Counter demand position. TS 3.1.4 Condition B provides the Required Actions and associated Completion Times when one rod is not within the above alignment. None of the Required Actions of Condition B require the affected Unit be shutdown. With more than one rod not within the above alignment limit, TS 3.1.4, Condition D, Required Action D.2 requires the affected Unit be in MODE 3

## LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
McGuire Nuclear Station, Unit 1	05000369	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF 6
		2010	003	00	

## 17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

within 6 hours and plant procedures direct Operators to manually trip the Reactor.

Reactor Protection System [JC] (IPE):

The IPE System automatically keeps the Reactor operating within a safe region by shutting down the Reactor whenever the limits of the region are approached. Whenever a direct process or calculated variable monitored by the IPE System exceeds a set point, the IPE System automatically actuates to initiate a Reactor trip in order to protect against either gross damage to fuel cladding or loss of system integrity which could lead to release of radioactive fission products into the Containment. Using either of two Control Board switches, Reactor Operators may elect to manually actuate the IPE System to open the Reactor Trip Breakers and initiate a Reactor trip.

Auxiliary Feedwater System [BA] (CA):

The CA System provides an emergency feedwater supply to the Steam Generators [SG] (SG) if the respective Unit's Condensate and Feedwater System [SJ] (CF) is not available to maintain SG water inventory. This ensures the capability to transfer fission product decay heat and other residual heat loads from the Reactor Coolant System [AB] (NC) during both normal operation and accident conditions. Each Unit's CA system contains an "A" and "B" Train Motor Driven Pump [P] (MDCAP) and a "C" Train Turbine Driven Pump [P] (TDCAP). These pumps will automatically actuate upon receipt of a signal satisfying the logic for automatic start of the respective pump or each pump can be manually actuated from the Control Room.

EVENT DESCRIPTION

On June 10, 2010, Unit 1 was at 100% power with all Shutdown Bank rods and Control Bank rods operable and within the alignment limit specified in TS 3.1.4. At approximately 15:54 hours, Unit 1 Shutdown Bank "B" Rod N7 dropped fully into the Reactor core which represented a condition where this rod was not within the alignment limit of TS 3.1.4. Subsequent to the dropped Rod N7, the Required Actions of TS 3.1.4 Condition B were implemented within the Required Action times and Operations began a load reduction on Unit 1 as directed by procedure AP/1/A/5500/14 - "Rod Control Malfunction".

## LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
McGuire Nuclear Station, Unit 1	05000369	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 6
		2010	003	00	

## 17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

On June 12, 2010 at approximately 06:44 hours, Unit 1 Shutdown Bank "B" Rod J13 dropped fully into the Reactor core. At the time Rod J13 dropped, the Unit 1 Reactor was at approximately 44% power and troubleshooting of Unit 1 Shutdown Bank "B" Rod N7 was in progress, with Rod N7 still dropped into the Reactor core. With two rods dropped into the Reactor core, this represented a condition where more than one rod was not within the alignment limit of TS 3.1.4. As per TS 3.1.4, Required Action D.2, this condition required Unit 1 be placed in MODE 3 within 6 hours. As directed by procedure AP/1/A/5500/14, Operators initiated a Unit 1 Reactor trip at approximately 06:44 hours by manually actuating the IPE System. Upon trip of the Reactor, Unit 1 entered MODE 3 which represents a shutdown condition.

As expected, following the Unit 1 Reactor trip, the "1A" CF Pump went to rollback hold and SG levels dropped. At approximately 06:48 hours, the 1A and 1B MDCA Pumps were manually actuated in response to decreasing SG levels. These pumps operated as designed to maintain Unit 1 SG inventories.

Manual actuation of the IPE and CA Systems is reportable pursuant to the requirements of 10 CFR 50.73 (a)(2)(iv)(A) - "System Actuation". As per 10 CFR 50.73 (a)(2)(i)(A), The Unit 1 Reactor trip is being reported as a completion of a shutdown required by plant Technical Specifications.

CAUSAL FACTORS

Trouble shooting and testing determined that a solder joint on a regulation card in the 1BD IRE System Power Cabinet experienced an intermittent connection. On June 10, 2010 and June 12, 2010, this intermittent connection caused a drop in the current supply to the CRDMs served by this Power Cabinet, which includes the CRDMs for Unit 1 Shutdown Bank "B" Rod N7 and Rod J13. These current drops were not of sufficient duration to initiate any rod control alarms. On June 10, 2010, current dropped to a level which allowed the CRDM gripper for Shutdown Bank "B" Rod N7 to drop this rod into the core. Similarly, on June 12, 2010, current dropped to a level which allowed the CRDM gripper for Shutdown Bank "B" Rod J13 to drop this rod into the core. On both June 10, 2010 and June 12, 2010, the currents to the CRDMs for all other rods served by the 1BD IRE System Power Cabinet were maintained at values sufficient to hold these rods.

The intermittent connection on the regulation card in the 1BD IRE System Power Cabinet is attributed to a degraded solder joint. The most

## LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
McGuire Nuclear Station, Unit 1	05000369	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 6
		2010	- 003	- 00	

## 17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

probable cause of the degraded solder joint is cracking due to vibration experienced during normal plant operation. Further cause investigation associated with this event is in progress. If the results of this ensuing evaluation identify any information that might materially affect the understanding of this event, the cause, or the corrective actions, Duke Energy will submit a supplement to this LER.

Note, periodic preventative maintenance (PM) is performed on the cards in the IRE System Power Cabinets to identify and repair as needed any degraded solder joints. In 2008, during the last performance of this PM on the 1BD Power Cabinet, no solder joint degradation was identified on the regulation card that experienced the degraded solder joint. Also, McGuire Nuclear Station has not experienced any previous occurrences of similar rod events caused by degraded solder joints on cards in the IRE System Power Cabinets.

CORRECTIVE ACTIONS

## Immediate:

1. Initial investigation identified that the dropped N7 and J13 rods could possibly be attributed to a degraded 1BD IRE System Power Cabinet regulation card, phase control card, or firing card associated with the rods. All three cards were replaced and quarantined.
2. The quarantined 1BD IRE System Power Cabinet regulation card, phase control card, and firing card were tested onsite. No issues were identified.

## Subsequent:

1. The quarantined 1BD IRE System Power Cabinet regulation card, phase control card, and firing card were sent to the vendor for failure analysis and testing, which identified the items discussed in the Causal Factors section of this LER.

## Planned:

1. Additional PM strategies will be evaluated for identifying degraded solder joints on cards in the IRE System Power Cabinets.

## LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
		2010	- 003	- 00	
McGuire Nuclear Station, Unit 1	05000369				6 OF 6

## 17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

2. Evaluate replacement of selected cards in the IRE System Power Cabinets with an upgraded card.

SAFETY ANALYSIS

Duke Energy used a risk-informed approach to determine the risk significance associated with the Unit 1 Reactor trip experienced on June 12, 2010.

The Conditional Core Damage Probability (CCDP) and the Conditional Large Early Release Probability (CLERP) of this event were evaluated by considering the following:

- A Reactor trip initiating event.
- Actual plant configuration, equipment unavailability, and maintenance activities at the time of the Unit 1 Reactor trip.

The CCDP associated with this event was determined to be less than 1.0E-06. The CLERP associated with this event was determined to be less than 1.0E-7.

This event is considered to be of no significance to the health and safety of the public.

ADDITIONAL INFORMATION

To determine if a recurring or similar event exists, a search of the McGuire Problem Investigation Process (PIP) database was conducted for a time period covering 5 years prior to the date of this event. Based on Duke's definition of a recurring event, similar significant event with the same cause code, no recurring events were identified.